

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 1, 2016/2017

**PEM0044 – ESSENTIAL MATHEMATICS**

( All sections / Groups )

10 OCTOBER 2016

9.00 a.m. – 11.00 a.m.

( 2 Hours )

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### INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages with 4 questions only, excluding the cover page.
2. Attempt ALL FOUR questions.
3. Write all your answers in the Answer Booklet provided. Show all necessary workings.
4. The formula sheet is attached at the end of this question paper.

**Question 1 (31 marks)**

a) Solve the following equation or inequality:

i) 
$$\frac{-5}{2x-3} = \frac{7}{3-2x} + \frac{11}{3x+5} \quad (8 \text{ marks})$$

ii) 
$$x(x+5) + 3 \leq 6 - x^2 \quad (9 \text{ marks})$$

b) Find an equation of the line that:

i) Passes through (2, 7) and (4, 13). (4 marks)

ii) Passes through (2, 7) and is parallel to the line  $2y + 5x - 2 = 0$ . (6.5 marks)

iii) Passes through (3, 11) and is perpendicular to the line passing through (2, 7) and (4, 13). (3.5 marks)

**Question 2 (16 marks)**

a) The third term of an arithmetic sequence is 7 and the 20<sup>th</sup> term is 41. Find the first term and the common difference. Then, find the sum of the first 20 terms. (8 marks)

b) Consider the geometric sequence: 12, 4, 4/3, 4/9, ...

i) Determine the first term and common ratio. (3 marks)

ii) Find the 8<sup>th</sup> term. (2 marks)

iii) Find the sum of first nine terms of the sequence. (3 marks)

Continued...

**Question 3 (23 marks)**

Consider the following matrix:

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & -2 & -3 \\ 3 & 2 & 4 \end{bmatrix}$$

a) Find  $A^{-1}$ . (17 marks)

b) Using the inverse method, solve the equation:  $\begin{bmatrix} 2 & 1 & 1 \\ 1 & -2 & -3 \\ 3 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 5 \end{bmatrix}$ . (6 marks)

**Question 4 (30 marks)**

a) Find  $\frac{dy}{dx}$  for the following function:

i)  $y = \frac{3}{\sqrt{x}} - 5\sqrt{x} + \pi$ . (5 marks)

ii)  $y = (x^2 - 5x + 6)(3 - x^2)$  by using the product rule. (6 marks)

b) Use the chain rule to find  $\frac{dy}{dx}$  for  $y = \left(\frac{1}{3}x^3 + 5x\right)^7$ . Then, evaluate  $\frac{dy}{dx}$  at  $x = 1$ . (8 marks)

c) Evaluate the following integrals:

i)  $\int 2(3x+1)(3x^2+2x-1)^3 dx$  (5 marks)

ii)  $\int_2^4 \left(\frac{1}{8}x^3 + 2x\right) dx$  (6 marks)

End of Page.

COURSE CODE: PEM0044  
 COURSE NAME: ESSENTIAL MATHEMATICS

### FORMULAE

#### 1. Differentiation

*The Power Rule:*

$$\frac{d}{dx} [x^n] = nx^{n-1}$$

*The Product Rule:*

$$\frac{d}{dx} [uv] = u \frac{dv}{dx} + v \frac{du}{dx}$$

*The Quotient Rule:*

$$\frac{d}{dx} \left[ \frac{u}{v} \right] = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

*The Chain Rule:*

If  $n$  any real number,  $u = g(x)$  is differentiable, then

$$\frac{d}{dx} [u^n] = nu^{n-1} \times \frac{du}{dx}$$

#### 2. Integration

i)  $\int k \, dx = kx + C$

ii)  $\int x^n \, dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$

iii)  $\int cf(x) \, dx = c \int f(x) \, dx$

iv)  $\int [f(x) \pm g(x)] \, dx = \int f(x) \, dx \pm \int g(x) \, dx$